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September 21, 1998

BY HAND DELIVERY

RECEIVED
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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas
Office of the Secretary
Federal Communications Commission
1919 M Street, N.W., Suite 222
Washington, D.C. 20554

Re: WT Docket No. 98-136

Dear Ms. Salas:

Attached for filing please find an original and four copies of the Comments of Hughes Communications, Inc. in the above-referenced rulemaking. Thank you.

Sincerely,

Arthur S. Landerholm
of LATHAM & WATKINS

Enclosures

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Amendment to Part 27 of the Commission's Rules to Revise Rules for Services in the 2.3 GHz Band and To Include Licensing of Services In the 47 GHz Band	)	WT Docket No. 98-136

COMMENTS OF HUGHES COMMUNICATIONS, INC.

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FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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for Services in the 2.3 GHz Band and	)	WT Docket No. 98-136
To Include Licensing of Services	)	
In the 47 GHz Band	)	
	)	

COMMENTS OF HUGHES COMMUNICATIONS, INC.

Hughes Communications, Inc. ("HCI") submits these Comments in response the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned docket. The Hughes family of companies are leaders in the field of satellite construction and satellite services. As an applicant for satellite systems that would use the spectrum at issue, HCI has a vital interest in this proceeding.

I. INTRODUCTION AND SUMMARY

HCI has on several occasions explained the critical need to maintain access for satellite systems to substantial amounts of contiguous bandwidth in the 36.0 - 51.4 GHz band (the "Q/V band"), including the 47.2 - 48.2 GHz FSS uplink band that is the subject of this proceeding. The amount of bandwidth available under the C, Ku, and Ka band allocations will not be sufficient to satisfy the rapidly expanding demand for FSS, BSS, and MSS services. The existing global allocations for satellite services in the Q/V band represent crucial expansion spectrum needed for new satellite systems, as well as the potential to provide innovative services

that to date have not been possible. Satellite technology has developed to the point where the amount of satellite capacity and the nature of satellite services is no longer primarily constrained by spacecraft hardware. To the contrary, today's spacecraft are capacity constrained principally by the amount of spectrum that is allocated for them to use. Thus, larger satellite spectrum allocations facilitate the development of higher capacity systems, which, in turn, reduce the ultimate cost of service to the end user, and increase the competitiveness of satellite services. For these reasons, access to the 47.2 - 48.2 GHz uplink band for satellite systems, along with additional uplink bands, is critical to the future of the U.S. satellite industry.

The Commission's proposed service rules for the 47 GHz band are incomplete in that they do not sufficiently protect against interference between a terrestrial user and a satellite user that are licensees of adjacent REAGs. Thus, without constraints on the terrestrial use of the band, the Commission's promise of access to the 47 GHz band for satellite use may be an empty one. Additionally, the Commission has not met its burden under Section 309(j)(6)(E) of the Communications Act to explore engineering solutions to avoid mutual exclusivity before selecting auctions as a licensing method. The Commission's statutorily-mandated responsibility in this regard is especially important in this case, given the well-recognized difficulties inherent in utilizing auctions for licensing international systems, such as many of the satellite systems proposed for implementation in the Q/V band.

II. AUCTIONS

HCI applauds the Commission's confirmation that satellite systems should be permitted access to the 47.2 - 48.2 GHz band (the "47 GHz band"). However, in order to make that access meaningful, the licensing procedures and service rules for the 47 GHz band need to support the provision of satellite services there. To this end, HCI believes that the Commission's

predisposition toward auctions is premature because the Commission has not yet explored engineering solutions to facilitate potential sharing between satellite and terrestrial users of this band.[1]

A. The Commission Must Consider Technical Limitations on the Use of the 47 GHz Band

There are a number of significant problems with the Commission's current proposal for the 47 GHz band. By effectively allowing use of the 47 GHz band without any technical constraints, different uses in adjacent license areas may be fundamentally incompatible as a technical matter and therefore may cause harmful interference to one another. Thus, to the extent that a terrestrial service licensed in one area is unconstrained in its potential to interfere with satellite system licensed to serve an adjacent geographic area, the Commission's assurance that satellite uses will not be precluded from utilizing the 47 GHz band[2] may be a hollow promise. Before the Commission could even consider to auction the 47 GHz band, a potential satellite bidder therefore would need the assurance that the Commission had placed appropriate operational constraints on adjacent licensees that were sufficient to preserve continued satellite use of the band. More fundamentally, however, the Commission simply has not fulfilled its statutory obligation to utilize engineering solutions and service regulations to avoid potential mutual exclusivity at 47 GHz. Rather, by defining permitted uses of the 47 GHz band in the

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1 HCI acknowledges the changes to the Commission's statutory auction authority brought about by the Balanced Budget Act of 1997. Even though the Commission no longer has the discretion to use other licensing means in cases of mutual exclusivity, this new auction authority continues to impose an obligation on the Commission to "use engineering solutions, negotiation, threshold qualifications, service regulations, and other means in order to avoid mutual exclusivity in application and licensing proceedings." 47 U.S.C. § 309(j)(6)(E).

2 *NPRM* at ¶ 56.

broadest possible way and by failing to implement any technical limitations on operations in the band, mutual exclusivity appears inevitable. Thus, the Commission appears to have preordained the necessity for auctions without fulfilling its statutory mandate to use engineering solutions to avoide mutual exclusivity.

In light of the unbounded combination of services and radiofrequency transmission characteristics that are possible under the Commission's proposal, it simply is not possible to analyze every possible interference potential between different uses of the 47 GHz band in neighboring license areas. However, HCI has conducted an analysis that demonstrates how, absent the imposition of power and/or elevation angle limits on a terrestrial transmitter in the 47 GHz band, a terrestrial transmitter in one REAG might cause harmful interference into a satellite system that is proposed to serve an adjacent REAG (see attached technical appendix).

The Commission historically has facilitated the shared use of frequency bands through the imposition of power limits, elevation angle restrictions, coordination thresholds, geographic separation, and other technical means. Those tools are generally understood by industry, have been fully developed, and may well form the basis for facilitating access to the 47 GHz band by different services (*e.g.*, satellite and HAPS). Unfortunately, the Commission has not yet even begun to consider how these tools can be used to eliminate mutual exclusivity in the 47 GHz band. Spectrum sharing analyses regarding the Commission's flexible use proposal have not been done, and while studies of HAPS/satellite sharing have been initiated at the ITU, those studies are still in progress and have not been completed. Furthermore, given the Commission's long-standing policy that raises a clear presumption against finding mutual

exclusivity among satellite applicants[3] and the number of orbital locations available at Q/V band, in all likelihood, there will not be any mutual exclusivity between satellite applicants for the 47.2 - 48.2 GHz band in the current satellite processing round.[4]

As set forth in HCI's attached technical analysis, absent the development of some type of co-frequency sharing mechanism for adjacent REAGs, it is virtually certain that unacceptable interference could exist between co-frequency, geographically adjacent 47 GHz licensees. And as the Commission has proposed virtually no technical standards for use of the 47 GHz band, it is virtually certain that different proposed applications will be mutually exclusive, even in adjacent license areas.

Thus, it is critical that the Commission and industry begin the process of developing appropriate constraints on the use of the 47 GHz band. Concomitantly, until the Commission exhausts its obligation to consider these types of technical sharing solutions, there is

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3 "[T]he objective of our policies and procedures has been to accommodate as many applicants as is efficiently possible with a minimum of administrative costs or delays. In particular, artificial or inflexible definitions of mutual exclusivity have been avoided and an increasing number of satellites have been authorized to satisfy growing demand. . . . The result has been an industry that has served the public interest through the timely implementation of facilities and services." *GTE Satellite Corp.*, 93 F.C.C. 2d 832, 840 (1983) ("*GTE Reconsideration Order*").

4 Indeed, in over 20 years and through numerous FSS processing rounds, the Commission has not once been faced with a case of mutually exclusive FSS satellite applications. *See, e.g.*, *Western Union Telegraph*, FCC 95-391 (released August 29, 1985) (no mutual exclusivity where "additional orbital locations were available for assignment"); *GTE Reconsideration Order*, 93 F.C.C. 2d at 839 (no mutual exclusivity where "at least one orbital location [was] available for assignment" in applicant's requested portion of the orbital arc, and where applicant's claim "ignored" Commission's satellite processing procedures which have avoided "artificial or inflexible definitions of mutual exclusivity.")

no basis for proceeding any further with the development of an auction-based license assignment scheme.

B. The Obligation to Consider Technical Solutions is Heightened By the Significant Policy Issues Presented by Satellite Auctions

The Commission's obligation to consider technical solutions is all the more critical in light of the serious policy issues raised by the possibility of satellite auctions. On a number of occasions, HCI has explained why it is contrary to the public interest to license international satellite systems by competitive bidding. Many other satellite interests, including the Satellite Industry Association, have put forth similar comments and analysis,[5] and the Commission has itself recognized the difficulties inherent in spectrum auctions for transnational systems.[6] Indeed, competitive bidding for satellite spectrum would likely hinder the development of new satellite technologies and threaten the deployment of U.S.-sponsored international satellite systems.

Each of the eight Q/V band applicants seeking to utilize the 47.2 - 48.2 GHz band for GSO and NGSO satellite systems has proposed an international system. While each of these systems has a critical nexus to the United States, each system's business plan is necessarily based

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5 *See Public Harms Unique to Satellite Spectrum Auctions*, submitted by the Satellite Industry Association in IB Docket No. 95-91.

6 *See Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, 12 FCC Rcd 5754, at ¶ 149 (1997) ("significant disadvantages involved in using auctions to license transnational services"); *Amendment Of Part 25 of the Commission's Rules to Establish Rules and Policies Pertaining to the Second Processing Round of the Non-Voice, Non-Geostationary Mobile Satellite Service*, 11 FCC Rcd 19841, at ¶ 80 (1996) ("Sequential auctions create significant uncertainty . . . [which] may be so severe that, given the high fixed cost of a global system, it may deter entry, and impede the provision of service and the development of new offerings."); *Revision of Rules and Policies for the Direct Broadcast Satellite Service*, 11 FCC Rcd 9712, at ¶ 151 (1995).

in large part on the ability to serve the global or regional market. The ability to spread satellite system fixed costs, including research and development, over a global or regional system is critical to the success of those Q/V band systems. Indeed, both the Commission's Ka band service rules (exporting the U.S. band plan for U.S. licensees who serve foreign nations) and its DISCO II order (streamlining access to the U.S. market for foreign satellite systems) have recognized the expanding international scope of next generation satellite systems. In short, now that the domestic satellite industry has matured and has begun to expand into the "frontier" spectrum of the Ka and Q/V bands, satellite operators are increasingly dependent on international service capabilities.

Of course, the Commission is not able to license all of the rights needed by an operator of a international satellite system.[7] After obtaining a license to serve the United States, the operator will need to acquire "landing rights" to provide service to a foreign country. U.S.-sponsored systems already face substantial hurdles in their quest to obtain these landing rights; the use of competitive bidding for U.S. satellite spectrum in a critical segment of the Q/V band undoubtedly will complicate efforts to acquire landing rights abroad.

If the U.S. were to auction satellite spectrum in the 47 GHz band, other countries would be encouraged to auction Q/V band spectrum rights in their jurisdictions as well. Even if countries opt not to auction spectrum, they will be encouraged instead to impose fees based on the value of the spectrum licensed in the U.S. before they award U.S.-sponsored systems the

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[7] *See Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band, to Reallocate the 29.5 - 30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services and Suite 12 Group Petition for Pioneer's Preference*, 11 FCC Rcd 53, ¶ 128 (1995).

right to access those countries. This development could significantly increase the costs of deploying a global satellite system.

Moreover, the threat of foreign spectrum auctions creates valuation problems with respect to bidding for U.S. spectrum rights. For a number of reasons, it is extremely difficult for the "market" to take into account the uncertainty and increased costs that may arise with respect to acquiring foreign landing rights. First, reliable information about these costs will not be available until after U.S. auctions are held. Second, it is difficult for the industry to estimate the prices that they will be willing to pay to acquire spectrum rights in foreign regions that are critical to make a global system a success, because there are no prior relevant market results on which to draw. Third, there is relatively little other data from which to draw: there currently is no ongoing "trading" in foreign spectrum rights that takes into account these costs and uncertainties and, in any event, there are very, very few participants in this global market. With no previous market results and relatively little other information to provide guidance, it is difficult, if not impossible, to forecast the corresponding costs and uncertainty that will arise in acquiring critical spectrum rights for foreign markets. Therefore, the valuation process for U.S. spectrum will not likely be able to account fully for the new costs and uncertainty that may arise in a worldwide satellite auction scheme. This absence of reliable information is a market failure and could preclude the most valued user (satellite systems) from succeeding in an auction of the 47 GHz band.

Thus, despite the Commission's broadened auction authority, HCI remains concerned about the effect of domestic auctions on international satellite systems. The change in statutory authority has not solved the fundamental problems that domestic auctions pose for international satellite systems. Thus, in this context, it is particularly important that the

Commission adhere closely to its responsibility to encourage engineering solutions and other means to avoid mutual exclusivity between the potentially different users of the 47 GHz band (*i.e.*, terrestrial fixed, HAPS and satellite).

III. OTHER MATTERS

Below, HCI addresses a number of different issues in the NPRM on which the Commission has sought comment.

A. Effect of WRC-97. For a number of reasons, HCI does not believe that the results of WRC-97 preclude in any manner whatsoever the use of the 47.2 - 47.5 and 47.9 - 48.2 portions of the 47 GHz band for FSS uplinks.

First, the Commission historically has not allowed the results of a WRC to constrain its domestic allocation processes. For example, in 1993 the Commission adopted an approach to PCS licensing in a part of the 2 GHz band that had been set aside at WARC-92 for MSS service, a decision which subsequently required further WRC actions to replace the MSS spectrum that was allocated in the U.S. for a different purpose. And in 1995, the Commission adopted service rules that effectively set aside 100 MHz of spectrum for the NGSO FSS, even though the use of that band was the subject of further study and the results of the upcoming WRC.

Second, on November 21, 1998, prior to the end of WRC-97, the FCC submitted to the ITU advance publication notices in support of the U.S. satellite systems that were filed in the Commission's pending Q/V band processing round. By the terms of WRC-97 RES COM 5-7, those notices, filed before the completion of WRC-97, are properly pending before the ITU (although further processing may be deferred pending the completion of sharing studies).

Thus, those FSS systems, and their related ITU filings, are fully consistent with international footnote S5.552A

Third, nothing in the results of WRC-97 suggests that FSS use of these bands should be precluded. To the contrary, RES COM 5-7 urges administrations "to facilitate coordination" between high altitude platform stations in the 47.2-47.5 and 47.9-48.2 GHz bands and "other co-primary services in their territory and adjacent territories." By definition, this includes an obligation to coordinate FSS uplinks, which are a co-primary service in these bands.

Finally, HCI has an application pending for a satellite system in these bands, called "SpaceCast," that would provide broadcasting (or BSS) services and therefore is wholly unaffected by the results of WRC-97, including S5.552A and RES COM 5-7. Thus, there is no reason to think that SpaceCast could be adversely affected by any recent ITU changes.

B. Channel Plan. With respect to the proposed channelization plan for the 47 GHz band, it appears that the Commission does not intend for that channelization plan to preclude FSS uplinks in any part of the 47 GHz band.[8] In other words, the entire 1.0 GHz potentially would remain available for FSS uplinks regardless of the channel plan that might apply to terrestrial users. HCI respectfully requests that the Commission confirm that this remains the case.

C. Spectrum Aggregation. Particularly with respect to entities that plan to provide FSS services, HCI agrees that there should not be any spectrum aggregation limits in the 47 GHz band.[9] As HCI previously has explained in a related docket,[10] frequency bands above 36

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8 *NPRM* at Appendix B, p. B-2 (proposed rule Section 27.5(c).

9 *See NRPM* at ¶¶ 74, 75.

GHz provide a unique opportunity to provide innovative, high-data-rate, broadband satellite services because of wide amounts of contiguous bandwidth that are available there. In particular, the chance to access a full 3 GHz of uplink spectrum from 47.2 - 50.2 GHz would facilitate unique services that cannot be provided in any other frequency band because of the narrow band segments that historically have been available for satellite services. These innovative types of services are the subject of the many pending Q/V band satellite applications, including HCI's SpaceCast and EXPRESSWAY systems. In order for these innovative systems to be viable, satellite systems need access to large amounts of contiguous bandwidth.

Moreover, in order to provide a viable satellite service in these bands, it is critical that large segments of bandwidth potentially be available to a single licensee across the entire U.S., not just in a single REAG or other license region. Thus, while HCI agrees with the Commission that there is a need to accommodate nationwide licenses in these bands,[11] HCI believes that the Commission should provide for the possibility of a nationwide license for the entire 1.0 GHz of the 47 GHz band. Of course, such a license would not mean that a single entity would be the only one who could use the band. The Commission long has recognized the inherent efficiencies of satellites: that co-coverage, co-frequency service is possible from a large number of satellites at different orbital locations. For example, using two or three degree orbital spacing, up to twenty or more different licensees could simultaneously provide competitive nationwide services in the full 1.0 GHz. Moreover, Part 25 of the Commission's rules has long

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10 Comments of Hughes Communications, Inc. dated May 5, 1997 in IB Docket No. 97-95.

11 *NPRM* at ¶ 87.

contained limitations on the number of orbital locations that a single licensee can be awarded at a single time.[12]

D. Build Out Requirements. With respect to build out requirements, HCI agrees with the proposal that an FSS provider be required to have launched at least one satellite that is capable of serving the licensed area by the ten year renewal mark.[13] However, HCI does not believe that the licensee should be required to have constructed one earth station per service area within that time frame. The reason is that satellite operators often do not own or operate the earth stations that are used to communicate with their spacecraft. In most cases, it is the end users of the satellite capacity (broadcast networks, terrestrial telecommunications providers, hospitals, universities, etc.) who own and operate satellite earth stations. And earth stations that are used to provide tracking, telemetry and command services often are owned by a different company that provides the TT&C service under contract. As a practical matter, as long as a spacecraft (which costs hundreds of millions of dollars) has been launched that is capable of serving the licensed area, the Commission can be assured that substantial service will be provided by the licenses within the ten year period.

IV. CONCLUSION

The Commission's proposed service rules for the 47 GHz band are incomplete in that they do not sufficiently protect against interference between a terrestrial user and a satellite user that are licensees of adjacent REAGs. Thus, without constraints on the terrestrial use of the band, the Commission's promise of access to the 47 GHz band for satellite use may be an empty

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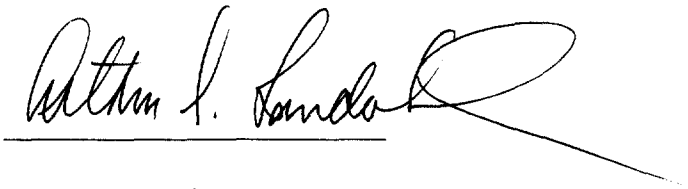
12 47 C.F.R. 25.140(e) and (f).

13 *NPRM* at ¶ 90.

one. Additionally, the Commission has not met its burden under Section 309(j)(6)(E) of the Communications Act to explore engineering solutions to avoid mutual exclusivity before selecting auctions as a licensing method. The Commission's statutorily-mandated responsibility in this regard is especially important in this case, given the well-recognized difficulties inherent in utilizing auctions for licensing international systems, such as many of the satellite systems proposed for implementation in the Q/V band.

Respectfully submitted,

HUGHES COMMUNICATIONS, INC.



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September 21, 1998

TECHNICAL APPENDIX

INTERFERENCE ANALYSIS BETWEEN A HAPS SYSTEM AND EXPRESSWAY™ IN THE 47.2 – 48.2 GHZ FREQUENCY BAND

I. Introduction

This paper shows that potential co-frequency interference situations exist between adjacent Regional Economic Area Groupings (REAGs) if there is an absence of technical limitations in the rules to facilitate spectrum sharing between and among services and systems. For purposes of considering interference into a satellite system, we use parameters of the Expressway™[1] system that HCI has applied for. We have assumed certain parameters for the interfering signal from a HAPS system as described below.

II. Absence of Technical Limitations in the Rules Creates Potential Interference Situations

Figure 1 graphically shows the geometry of a potential interference situation from a HAPS system to a geostationary satellite system near a boundary of two REAGs. In this example, it is assumed that REAG 2 is licensed to an entity that provides satellite service, and REAG 1 is licensed to an entity that provides a HAPS Fixed Service. For a particular HAPS system design, the elevation angle from the HAPS transmitter to the HAPS and satellite is assumed to be approximately 35° based on elevation angle information from Figure 2.

Figure 2 shows a 0.3° satellite receive antenna beam at 47 GHz as projected onto the earth surface into the northern part of REAG 2 from 103°W orbit position, an orbit position requested for HCI's Expressway™ system. The beam boresight is approximately located over Baltimore, Maryland. Each position on the earth surface has a specific elevation angle to a particular geostationary orbit position. For example, a HAPS transmitter located in REAG 1 northeast of Philadelphia, Pennsylvania, as depicted in Figure 2, has an approximate elevation angle of 35° to the 103°W orbit position. With

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1 Hughes Communications, Inc., *Amended and Restated Application of Hughes Communications, Inc., for Authority to Construct and Operate Expressway™, a Global Telecommunications Satellite System* (filed September 1997).

the above placement of the Expressway™ satellite receive antenna beam on the earth surface, the HAPS transmitter position is located at about 4 dB down from the peak of the satellite beam. Thus an in-line satellite interference event is possible even though the HAPS transmitter intends to communicate only with the HAPS system.

Because there is no limitation proposed in the NRPM on system designs, a particular set of HAPS parameters has been assumed as the basis for interference calculations in Table 1. The Power Flux Density Limit at the satellite, as shown in Table 1, is a particular uplink threshold derived from an acceptable C/I to Expressway™. If that threshold is exceeded by the HAPS, Expressway™ will experience harmful interference.

The first section of Table 1, "1 to 1 Total Signal Bandwidth Difference," shows that if the HAPS transmitter uplinked a signal with the same bandwidth as that of Expressway™ signal, the HAPS transmitter could cause harmful interference to a satellite in excess of 19 dB, depending on the position of the HAPS transmitter with respect to the satellite receive antenna footprints. For the case mentioned in the previous sentence, the HAPS transmitter is assumed to be located at the –4 dB contour of the satellite receive antenna footprints. If the HAPS transmitter were located at the –2 dB contour, the interference level into satellite would be worse, resulting in a margin close to –22 dB.

The second section, "3 to 1 Total Signal Bandwidth Difference," shows that if the bandwidth of the HAPS signal were one-third of that of the satellite signal, the interference could be in excess of 15 dB if the HAPS transmitter were located at the –4 dB contour of the satellite receive antenna footprints. If the HAPS transmitter were located at the –2 dB contour, the interference level into satellite would be worse, resulting in an approximate margin of –17 dB.

In addition to the in-line interference situation discussed above, the combined uplink power from antenna sidelobes of other HAPS transmitters and other service stations operating at the same frequency would further increase the interference level into an Expressway™ uplink. This additional level of interference can only be assessed when

additional information on HAPS and other system (e.g., traditional Fixed and Mobile) designs become available.

Although the above analyses use Expressway™ parameters, similar results are expected for other satellite systems in the 47 GHz frequency band.

III. Conclusion

Based on the above results, harmful co-frequency interference across license area boundaries can occur between 47 GHz systems licensed to operate in adjacent service areas.

Figure 1. HAPS Uplink Interference into Satellite

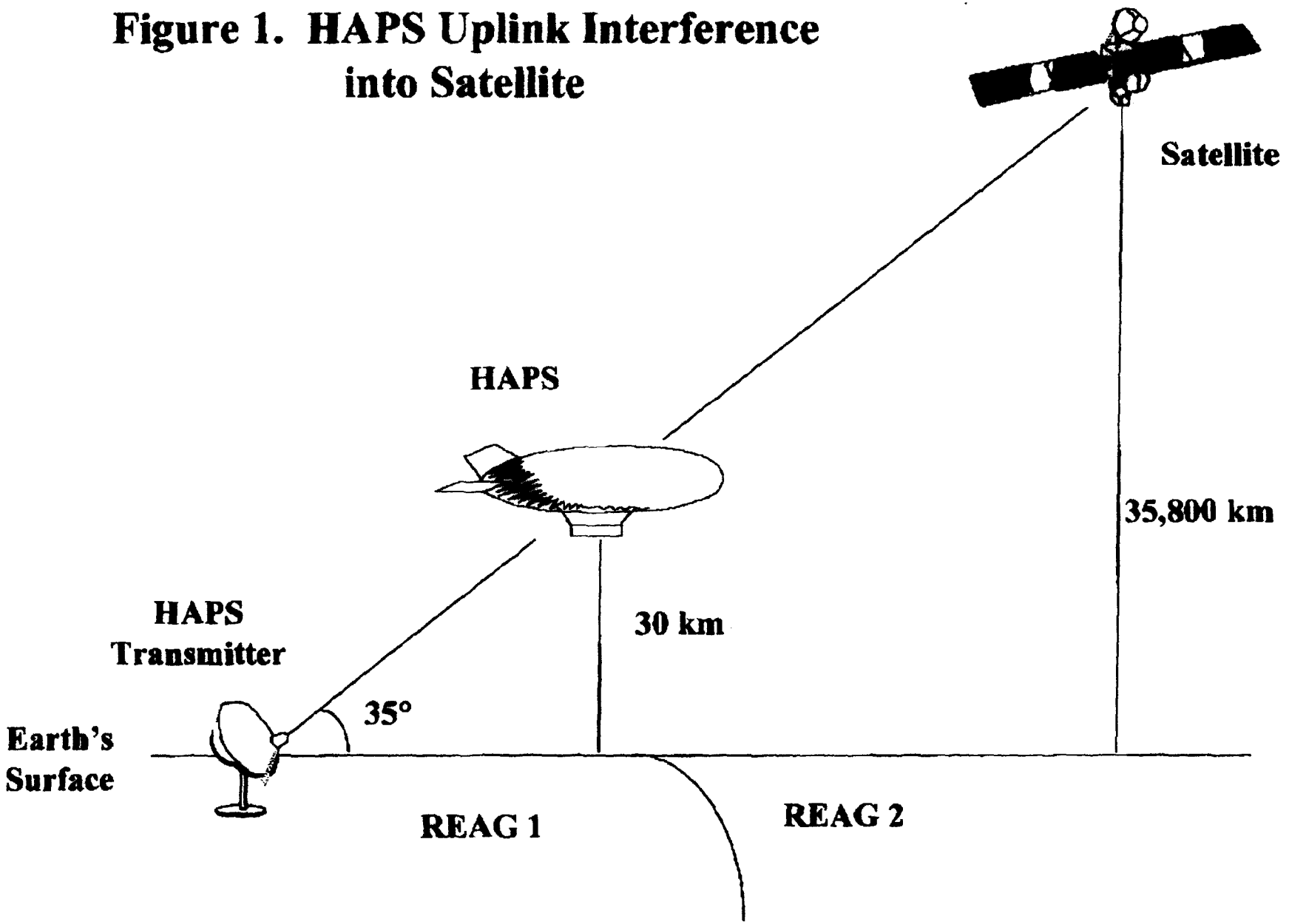

Figure 2. Satellite Receive Antenna Beam (0.3 Degrees)
(Satellite at 103W Orbit Position)
(32, 34, 36, 38, and 40 Degree Elevation Contours)

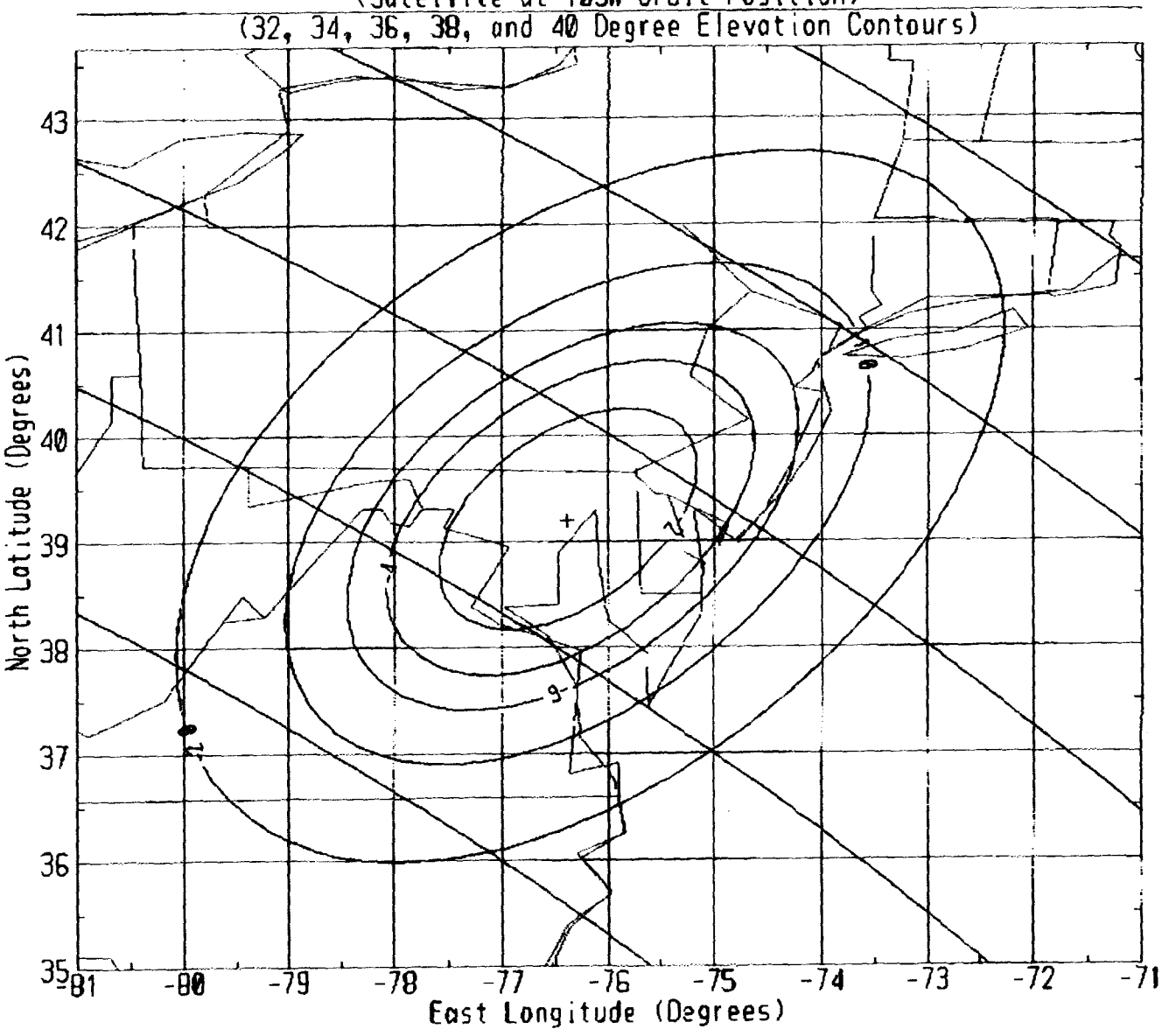

Table 1. HAPS Uplink Interference into Satellite			
1 to 1 Total Signal Bandwidth Difference	**Relative HAPS E/S Position (dB)**	**Relative HAPS E/S Position (dB)**	**Relative HAPS E/S Position (dB)**
	-2.0	**-4.0**	**-6.0**
HAPS Maximum Saturated EIRP (dBW)	32.0	32.0	32.0
Satellite Receive Antenna Roll-Off from Peak (dB)	-2.0	-4.0	-6.0
Slant Range (km)	38,500	38,500	38,500
Dispersion Loss (dB/m^2)	162.7	162.7	162.7
HAPS Maximum Power Flux Density (dB[W/m^2/4 kHz])	-145.1	-147.1	-149.1
Power Flux Density Limit at Satellite (dB[W/m^2/4 kHz])	-167.0	-167.0	-167.0
Power Flux Density Margin (dB)	-21.9	-19.9	-17.9
Total Bandwidth Difference Between Two Signals (dB)	0.0	0.0	0.0
Margin After Accounting for Bandwidth Difference (dB)	**-21.9**	**-19.9**	**-17.9**
3 to 1 Total Signal Bandwidth Difference	**Relative HAPS E/S Position (dB)**	**Relative HAPS E/S Position (dB)**	**Relative HAPS E/S Position (dB)**
	-2.0	**-4.0**	**-6.0**
HAPS Maximum Saturated EIRP (dBW)	32.0	32.0	32.0
Satellite Receive Antenna Roll-Off from Peak (dB)	-2.0	-4.0	-6.0
Slant Range (km)	38,500	38,500	38,500
Dispersion Loss (dB/m^2)	162.7	162.7	162.7
HAPS Maximum Power Flux Density (dB[W/m^2/4 kHz])	-145.1	-147.1	-149.1
Power Flux Density Limit at Satellite (dB[W/m^2/4 kHz])	-167.0	-167.0	-167.0
Power Flux Density Margin (dB)	-21.9	-19.9	-17.9
Total Bandwidth Difference Between Two Signals (dB)	4.8	4.8	4.8
Margin After Accounting for Bandwidth Difference (dB)	-17.1	-15.1	-13.1

Engineering Certification

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this petition, that I am familiar with Parts 25 and 27 of the Commission's Rules, that I have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of my knowledge.

By: 

Vu Phan, Manager
Regulatory Affairs & Spectrum Management
Hughes Communications, Inc.

September 21, 1998